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B63B 1/38

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B7A ADG A112

(56) Documents Cited

GB 2112718 A

GB 2063181 A

GB 1190621 A

GB 0776000 A

US 3742888 A

US 1121006 A

(58) Field of Search

UK CL (Edition L) B7A ADG

INT CL<sup>5</sup> B63B 1/38

(54) Boat hull with reduced friction

(57) A boat 10 having a hull, the under surface of which hull is divided by a plurality of walls 23, 24, 26, 27, 28, into a plurality of cells 21, means being provided to provide pressurised air, and means 31 being provided to pass pressurised air to the undersurface of the hull between the walls, whereby the walls tend to retain the air provided thereby between the under surface of the hull and the water to thereby reduce friction.

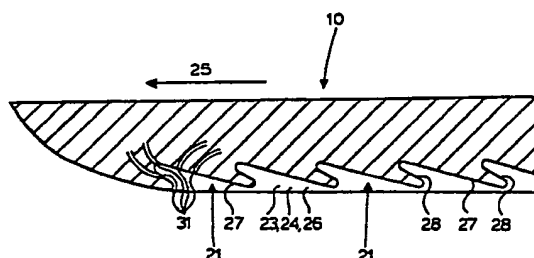


FIG 2

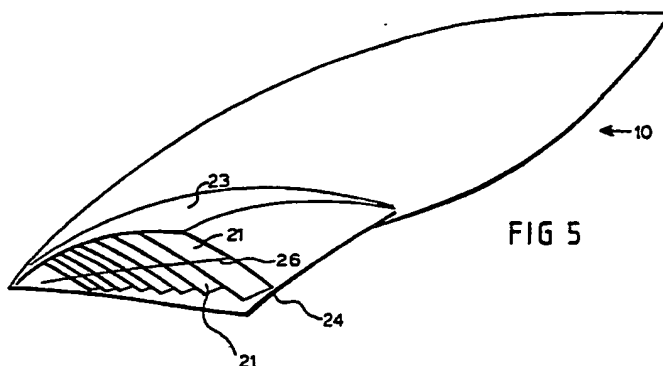


FIG 5

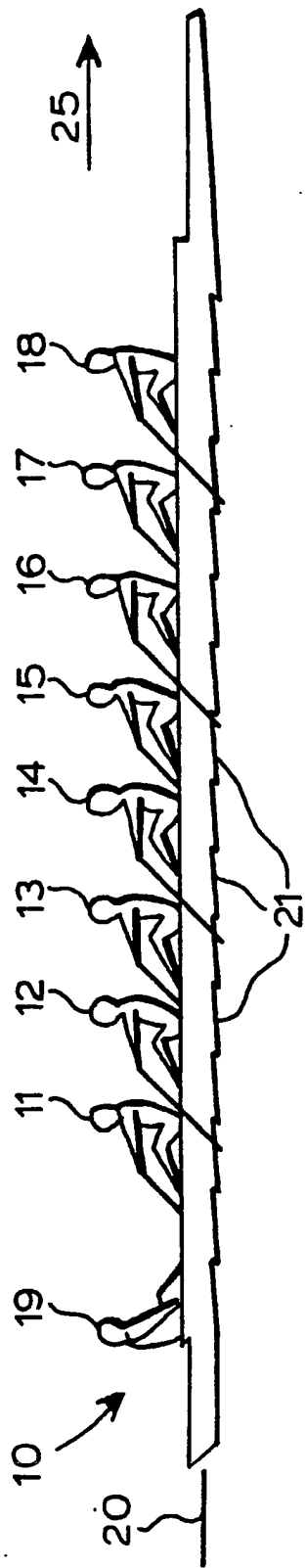


FIG 1

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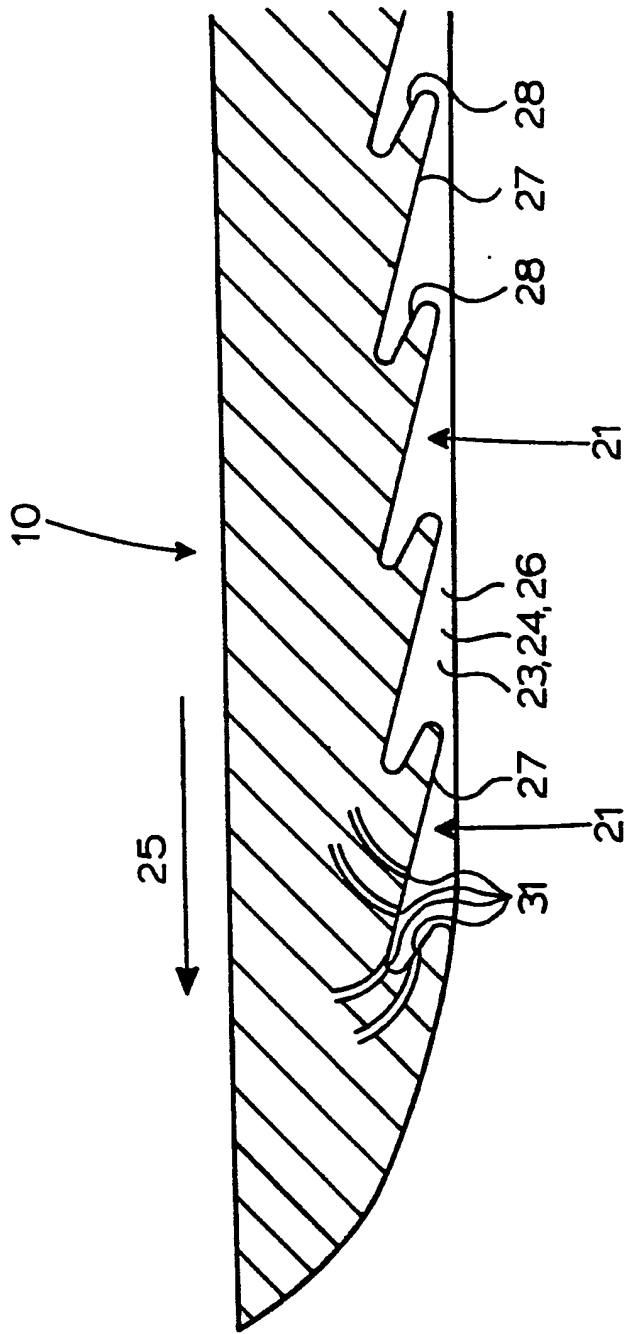


FIG 2

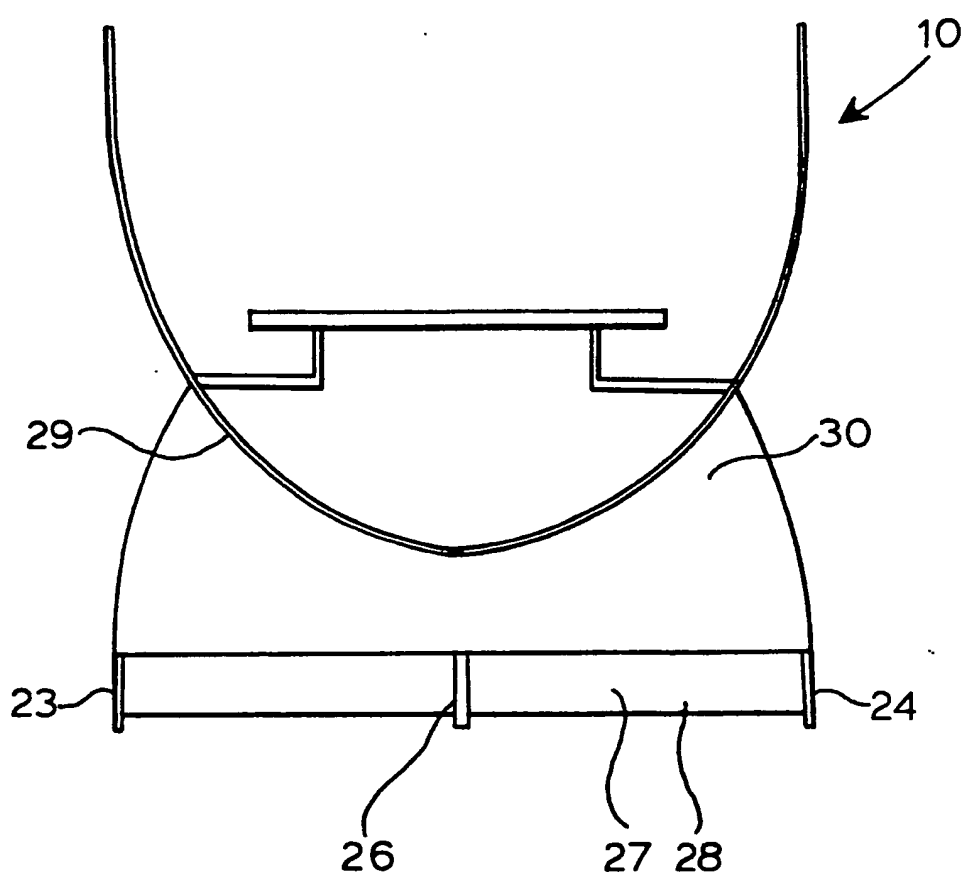


FIG 3

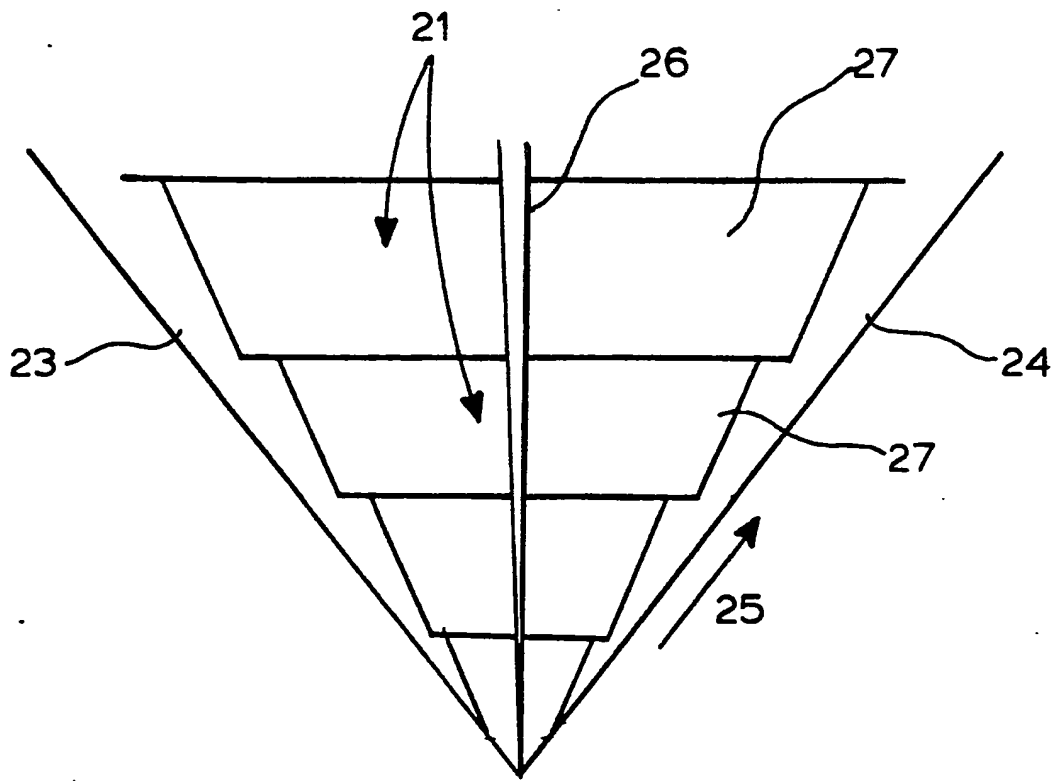
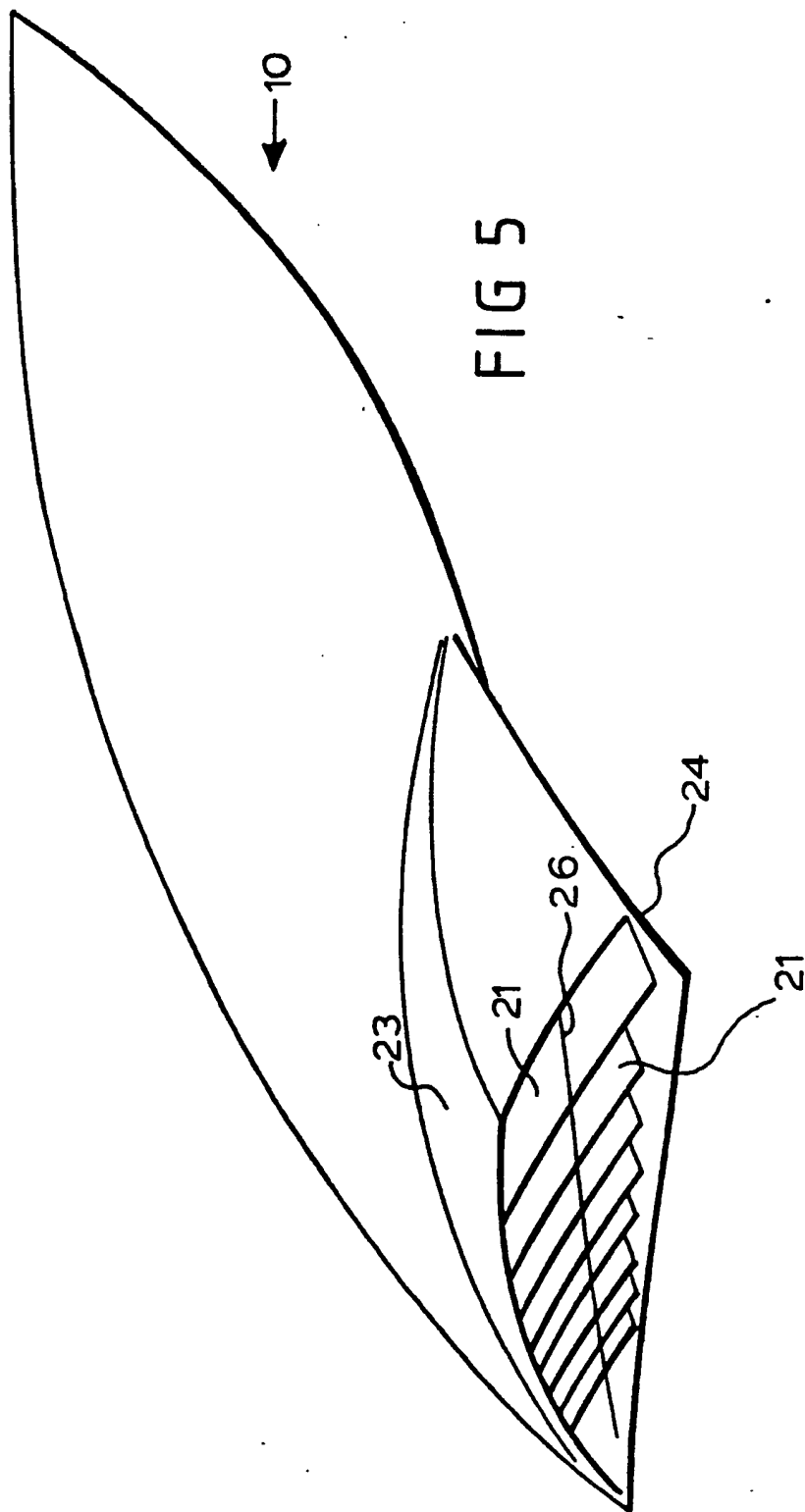


FIG 4



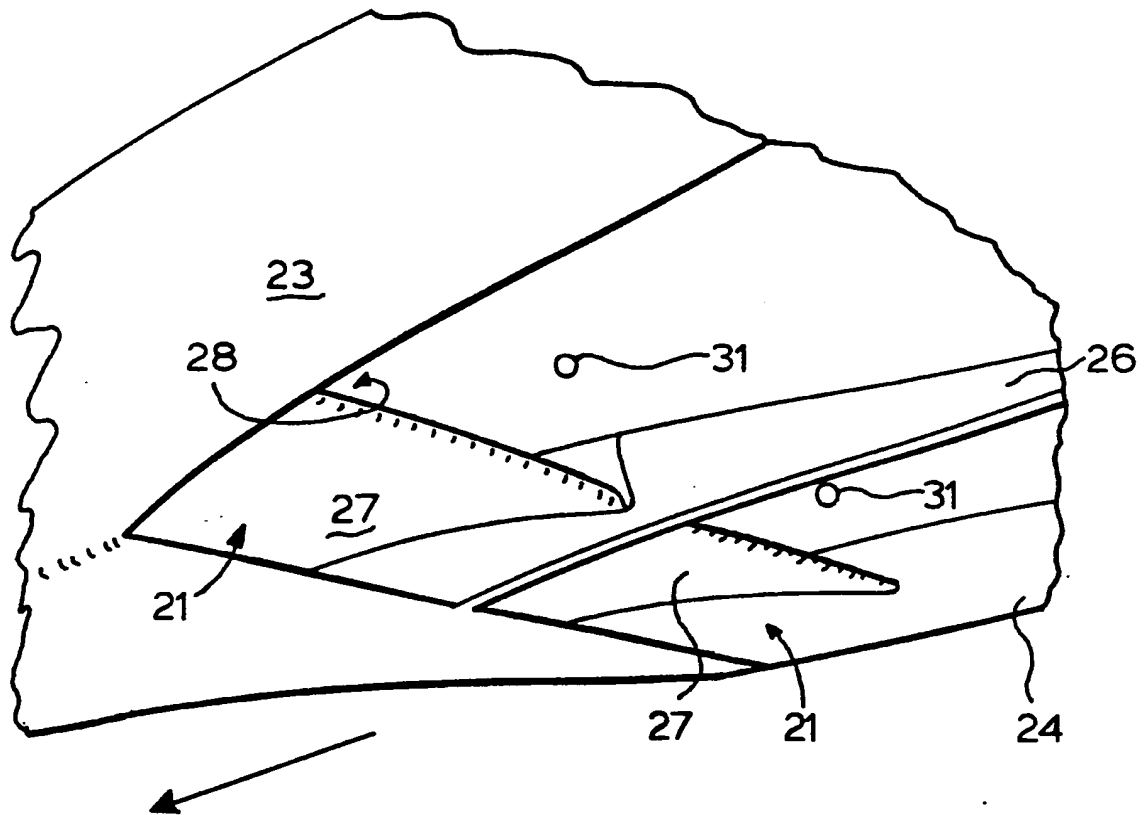
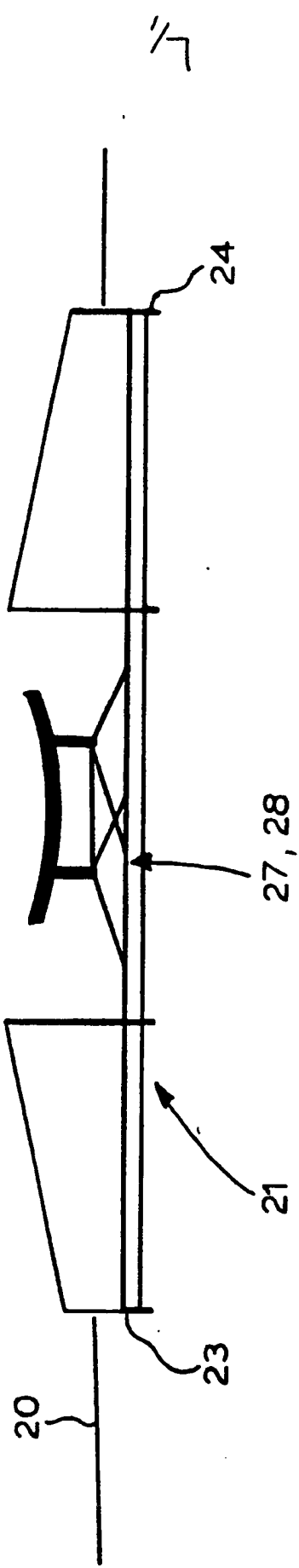


FIG 6



BOAT

5 The present invention relates to a boat. Many methods have been proposed for reducing the friction between the hull of a boat and the water and the present invention provides a simple way in which said friction may be reduced by providing, for example, a layer of air between at least part of the surface of the hull and the water.

10 The present invention provides, according to a first aspect, a boat having a hull, the under surface of which hull is divided by a plurality of walls into a plurality of cells, means being provided to provide pressurised air, and means being provided to pass pressurised air to the  
15 undersurface of the hull between the walls, whereby the walls tend to retain the air provided thereby between the under surface of the hull and the water to thereby reduce friction.

20 Preferably each cell is defined between a plurality of side walls which extend generally longitudinally parallel to the axis of the boat and which extend downwardly from the under surface of the hull. Preferably each cell is defined between two end walls, the end walls extending generally  
25 transverse the axis of the boat, the two end walls being sloped with respect to the direction of movement of the boat.

30 The means for providing pressurised air may be, in a simple arrangement, a simple pressurised air bottle, or may be a pump operated by a motor or by a power unit of the boat, or in a preferred arrangement in which the boat is a rowing boat, may be in the form of a pump operated by the rower, for example, operated by movement of the oars or by  
35 physical connection between the rower and the pump by, for

example, a strap.

Preferred arrangements of the invention will now be described by way of example only and with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic side view of a boat according to a first embodiment of the invention,

Figure 2 is a diagrammatic axial section of part of the boat of Figure 1,

Figure 3 is a transverse section of the boat of Figure 1,

Figure 4 is a diagrammatic perspective view of part of the underside of the hull of the boat of Figure 1,

Figure 5 is a view of the underside of the boat of Figure 1,

Figure 6 is a detail of part of the underside of the boat of Figure 1, and,

Figure 7 is a transverse section of a boat according to a second embodiment of the invention.

Figure 1 shows, in diagrammatic form, a boat in the form of a rowing eight 10, having eight rowers 11 to 18, and a cox 19 the water level being indicated at 20. Figure 1 indicates diagrammatically a series of cells 21 attached to the underside of the hull 22 of the boat 10. The form of the cells may be understood by reference to Figures 2 and 4. In Figure 4, which shows a perspective view of the underside of the hull 22, it will be seen that there are provided a series of cells defined between opposite side walls 23, 24 which extend generally vertically downwardly from opposite sides of the hull 22, and a central downwardly extending wall 26 which extends parallel to the keel line of the hull 22. End walls of the cells 21 are defined by two sloping portions, a shallow sloped wall 27 which also provides the bottom wall of each cell and an

acute sloped wall 28. The two sloped walls 27,28 are illustrated more clearly in Figure 2.

As is clear from Figure 2, there are provided for each cell  
5 21 one or more air inlets 31 for pressurised air.

The direction of travel of the boat in each of the diagrams is illustrated by the arrow 25.

10 Figure 3 shows a transverse section of the hull 22 from which it will be seen that the standard shape rowing eight hull 29 has the side walls 23,24 and sloped walls 27,28 attached to its underside to define the cells 21, and in the experimental arrangement, the side walls 23,24 and  
15 sloped walls 27,28 are formed of aluminium and the space between the various walls and the standard hull 29 is filled with a lightweight foam material 30. Figure 5 indicates how the cells are tapered towards the front and rear of the boat 10 by the curve of the opposite side walls  
20 23,24 towards one another.

The means for providing the pressurised air will now be described. This may be provided in several alternate forms. In one arrangement, the pressurised air may be  
25 supplied to the air inlets 31 from a pressurised tank, for example a pressurised air cylinder mounted in the boat 10. Such an arrangement will operate satisfactorily for short journeys.

30 Alternatively, however, a separate pump means for providing pressurised air may be provided. This may be in the form of a pump driven by, for example, an electric motor powered by a battery. In a boat which is not a rowing eight, but which has a motor, the pressurised air may be provided by  
35 the motor driving an air pump or exhaust from the motor

itself.

In a preferred arrangement we utilise movement of the oarsman 11 to 18 to provide the pressurised air. Thus in one arrangement, means may be attached to the seats of the oarsman which, as is well known, slide back and forth as the oarsman row, or attached to the oars themselves, or to the rowlocks, or indeed to the oarsman themselves by means of, for example, straps, to utilise the reciprocal motion to drive one or more pumps. Thus in a simple arrangement, there may be provided a pump for each oarsman, the oarsman's knee or chest being attached to the pump by means of a strap so that as the knee or chest is reciprocated during rowing, the pump is rotated to provide pressurised air.

In operation, therefore, as the oarsmen row the boat 10, they provided pressurised air which is passed through the air inlets 31 into the cells 21. The shape of the various side walls 23,24 and sloped walls 27,28 is such as to tend to trap air in the cells whilst providing minimal resistance to motion where the walls contact the water. Sufficient pressurised air should be provided to lift the sloped walls 27,28 clear of the water although the side walls 23,24 and spine wall 26 will dip into the water. In this way skin friction will be reduced between the boat 10 and the water.

In the alternative shown in Figure 7, instead of providing a structure added to an existing standard hull 29 the hull 29 may be disposed of and, effectively, the boat is raft shaped, that is with a substantially flat bottom but including cells 21 with side walls 23,24 and sloped walls 27,28 as in the embodiment of Figure 1. In this particular case the cells will be considerably wider than that in the

arrangement of Figure 1.

5 Skin friction is provided where the hull contacts the water, rowing eight, the length in transverse section along which the hull of Figure 1 contacts the water is about 71 cm, whereas in the arrangement of Figure 7, the water only contacts the side walls 23,24 and so only contacts the walls over approximately 15 cm. As can be seen from Figure 7 the remaining part of the hull is lifted above the water and in this case, therefore, the skin friction is considerably reduced.

10

The invention is not restricted to the details of the foregoing example.

CLAIMS

1. A boat having a hull, the under surface of which hull is divided by a plurality of walls into a plurality of cells, means being provided to provide pressurised air, and means being provided to pass pressurised air to the undersurface of the hull between the walls, whereby the walls tend to retain the air provided thereby between the under surface of the hull and the water to thereby reduce friction.
2. A boat as claimed in claim 1 in which each cell is defined between a plurality of side walls which extend generally longitudinally parallel to the axis of the boat and which extend downwardly from the under surface of the hull.
3. A boat as claimed in claim 1 or 2 in which each cell is defined between two end walls, the end walls extending generally transverse the axis of the boat, the two end walls being sloped with respect to the direction of movement of the boat.
4. A boat as claimed in any of claims 1 to 3 in which the means for providing pressurised air is a pressurised air bottle.
5. A boat as claimed in any of claims 1 to 3 in which the means for providing pressurised air is a pump operated by a motor or by a power unit of the boat.
6. A boat as claimed in any of claims 1 to 3 in which the means for providing pressurised air is a pump operated by the rower.

7. A boat as claimed in claim 6 in which the pump is driven by a strap means connected between the pump and the rower.

5 8. A boat as claimed in claim 1 substantially as hereinbefore described with reference to any of the Figures of the accompanying drawings.

**Patents Act 1977**  
**Examiner's report to the Comptroller under**  
**Section 17 (The Search Report)**

Application number

GB 9314024.2

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <p><b>Relevant Technical fields</b></p> <p>(i) UK Cl (Edition L ) B7A (ADG)</p> <p>(ii) Int Cl (Edition 5 ) B63B 1/38</p> <p><b>Databases (see over)</b></p> <p>(i) UK Patent Office</p> <p>(ii)</p> | <p><b>Search Examiner</b></p> <p>A HABBIJAM</p> <hr/> <p><b>Date of Search</b></p> <p>18 AUGUST 1993</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|

Documents considered relevant following a search in respect of claims 1-8

| Category<br>(see over) | Identity of document and relevant passages                                  | Relevant to<br>claim(s) |
|------------------------|-----------------------------------------------------------------------------|-------------------------|
| X                      | GB 2112718 A (LLOYD) see in particular<br>Figure 3 of the drawings          | 1-3, 5                  |
| X                      | GB 2063181 A (LLOYD) see in particular<br>Figures 2 and 5 of the drawings   | 1-3, 5                  |
| X                      | GB 1190621 (GRUNDY) see especially<br>Figures 1, 4 and 6 of the<br>drawings | 1-3, 5                  |
| X                      | GB 776000 (WILLIAMS) see Figures 1-3<br>in particular                       | 1, 2, 5                 |
| X                      | US 3742888 (CROWLEY) see for example<br>Figures 1-3 of the drawings         | 1-3, 5                  |
| X                      | US 1121006 (FAUBER) see for example<br>Figures 1-3                          | 1, 2, 5                 |

| Category | Identity of document and relevant passages | Relevant to claim(s) |
|----------|--------------------------------------------|----------------------|
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